DRAFT

EXECUTIVE SUMMARY

This Phase II accreditation support Package (ASP-II) provides the model user with confidence that model inputs and outputs are reasonably valid representations of real world conditions and outcomes. The overall objective of ASP-II activities is the identification of that set of problems for which *RADGUNS* is expected to produce reasonable results (the application domain). V&V inputs to such reviews can be divided into two categories:

> **Logical Verification**, which ensures that the basic equations, algorithms, and design of the model are reasonable and correct, and which identifies assumptions and limitations inherent in the implementation; and,

> **Face Validation**, which consists of input data verification and validation, comparison of model outputs with intelligence data and known or best estimates, and a review of sensitivity analysis results.

This *RADGUNS* ASP-II provides software design information in the **Conceptual Model Specification** (Section 2.0) that supports **Logical Verification** and **Sensitivity Analysis** results (Section 3.0) that support **Face Validation** activities. When coupled with ASP-I information, ASP-II provides the user with the best available confidence level in model results short of detailed, total model V&V, which is addressed in Phase III.

Table i-1 summarizes, by individual FE, the contents of *RADGUNS* ASP-II. Conceptual Model Specification (CMS) sections have been completed for 14 FEs. Sensitivity Analysis was conducted on all applicable FEs. Shaded entries are not applicable to this model; shaded entries with numbers indicate that some technical discussion is included, but no separate sensitivity analysis has been performed.

TABLE i-1. Functional Element Cross Reference Matrix.

Functional Area	#	Functional Element	2.0 CMS	3.0 SAR
1.0 Target Characteristics				
	1	1.1 Flight Path		3.1
	2	1.2.1.1 Signature RCS Static		3.2
	3	1.2.1.2 Signature RCS Dynamic		
	4	1.2.2 Signature Fluctuations	2.4	3.4
	5	1.3.1.1 ECM Noise On-Board	2.5	3.5
	6	1.3.1.2 ECM Noise Off-Board	2.6	3.6
	7	1.3.1.3 ECM Noise Standoff		3.7
	8	1.3.2.1 ECM Deception On-Board	2.8	3.8
	9	1.3.2.2 ECM Deception Off-Board		3.9
	10	1.3.2.3 ECM Deception Standoff		3.10
2.0 Propagation				
	11	2.1 Masking		3.11
	12	2.2 Clutter	2.12	3.12
	13	2.3 Multipath/Diffraction	2.13	3.13
	14	2.4 Atmospheric Attenuation		3.14

DRAFT

TABLE i-1. Functional Element Cross Reference Matrix.

Functional Area	#	Functional Element	2.0 CMS	3.0 SAR
3.0 Transmitter				
	15	3.1 Waveform Generator		3.15
4.0 Receiver				
	16	4.1 Thermal Noise		3.16
	17	4.2 AGC		3.17
	18	4.3 Detector		3.18
	19	4.4 Blanking		
5.0 Antenna				
	20	5.1 Gain	2.20	3.20
	21	5.2 Scan		
6.0 Signal Processing				
	22	6.1 Threshold	2.22	3.22
	23	6.2.1 Clutter Rejection MTI	2.23	3.23
	24	6.2.2 Clutter Rejection Doppler Filters		
	25	6.3 Integration	2.25	3.25
	26	6.4 Pulse Compression		
7.0 Target Tracking				
	27	7.1 Angle	2.27	3.27
	28	7.2 Range	2.28	3.28
	29	7.3 Doppler		
8.0 Fire Control Computer				
	30	8.1 Aiming solution		3.30
	31	8.2 Gun Movement		3.31
	32	8.3 Fire Enable/Disable		3.32
9.0 Guns/Ammunition				
	33	9.1 Fire Rate (Burst) Control		3.33
	34	9.2 Ballistics	2.34	3.34
10.0 End Game				
	35	10.1 Probability of Hit	2.35	3.35
	36	10.2 Probability of Kill		3.36
11.0 Radar Control				
	37	11.1 Search Modes		3.37
12.0 Reactions				
	38	12.1 Reacquisition		3.38
	39	12.2 Optical/Manual Tracking		3.39

Errors uncovered during verification of the Moving Target Indicator (MTI) FE in v.1.8 resulted in significant code changes in v.1.9. The MTI CMS section has been updated for v.2.0. Verification of the Probability of Hit FE revealed a discrepancy between the way that the area presented to the round at the closest point of approach is calculated for the 6- and 26-view representations. It is recommended that the user select the 26-view option if data is available. Results of detailed logical verification include characterizations of model functionality that do not agree exactly with the known physical world.   These characterizations are classified as either assumptions or limitations and are manifested in

either an individual FE or in the model as a whole (two or more FEs). A complete list of model assumptions and limitations is also contained in Section 3.0 of ASP-I. Given the frequencies and wavelengths of the radars modeled, and the short engagement ranges of the systems modeled, the assumptions used for the FEs examined appear reasonable.

Updated sensitivity analyses have been added for the Flight Path, Static RCS, Signature Fluctuations, Angle Track, Range Track, and Optical/Manual Tracking FEs. At the FE level, virtually any parametric variation in the transmitter/receiver (RF) portion of the model affects tracking to some degree and, therefore, shooting performance. Most of these parameters, however, are modeled as constants in *RADGUNS*, and it is important to note that *RADGUNS* simulates a *family* of systems rather than a particular system. Many model level MOEs, including target tracking and shooting performance, are significantly effected by target positioning errors (see Section 3.1). Thus, assessments of threat tracking and shooting performance at the model level will be driven by the accuracy of the reference tracker's target position data.